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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,955	02/23/2004	Chih-Chung Kuo	KUOC3019/EM	7575

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/782,955	KUO ET AL.	
	Examiner	Art Unit	
	Douglas C. Godbold	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-9* is/are allowed.

6)☒ Claim(s) *10-16* is/are rejected.

7)☒ Claim(s) *17 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to correspondence filed 11 December 2007 in reference to application 10/782,955. Claims 1-18 are pending in the application and have been examined.

Response to Amendment

2. The amendments filed 11 December 2007 have been accepted and considered in this office action. Claims 1 and 18 have been amended.

Response to Arguments

3. Applicant's arguments, see Remarks pages 8-12, filed 11 December 2007, with respect to claims 1-9 have been fully considered and are persuasive. The Rejections under 35 U.S.C 101, 102, and 103 of claims 1-9 has been withdrawn. The Rejections under 35 U.S.C 102of claims 10-16 and 18 has also been withdrawn.

4. Applicant's arguments filed 11 December 2007, with respect to claims 10-16 have been fully considered but they are not persuasive. Claim 10, although it does contain a segment measure verification step and a phonetic verification, it is not the limitations that are argued on page 10 of the arguments. Claims 10 does not teach a "segment confidence measure verification of all cutting points of N test speech unit segments to determine if the cutting points of the test speech unit segments are correct." Claim 10 only recites a segmental verifier for verifying the correctness of the

cutting points of test speech unit segments by obtaining a segmental confidence measure. It is not require by claim 10 that all speech segments cutting points are verified. Therefore the rejection of claim 10 and dependent claims under 35 U.S.C 103 was proper.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 10-12, and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. (Corpus-Based Mandarin Speech Synthesis with Contextual Syllabic Units Based on Phonetic Properties) in view of Modi et al. (US Patent 6,125,345).

7. Consider claim 10, Chou teaches an automatic speech segmentation and verification system (Figure 1, automatic segmentation.) comprising:

a database for storing a recorded speech corpus, the recorded speech corpus corresponding to a known text script, the known text script defining phonetic information with N phonetic units (With an accompanying orthographic transcription, the corpus can be segmented by labeling with the HMMs, page 894, column 1 line 27. Figure 1, step 1 Waveform and transcription are inputted. The transcription of the waveform would

inherently contain the N phonetic units of the waveform. A database would be inherent in order to allow for processing by a computer);

a segmenting unit, for segmenting the recorded speech corpus into N test speech unit segments referring to the phonetic information of the N phonetic units in the known text script (With an accompanying orthographic transcription, the corpus can be segmented by labeling with the HMMs, page 894, column 1 line 27. Figure 1, waveform and transcription are both inputted to SI HHM segmentation step, showing that both would be considered.);

a segment-confidence-measure verifying unit, for verifying segment confidence measures of N cutting points of the test speech unit segments to determine if the N cutting points of the test speech unit segments are correct (To evaluate the effects of the whole process, the output after the manual correction is set as the reference. The errors are calculated as the difference between the determined boundaries and the reference boundaries; page 894, column 2, line 40.);

a determining unit, for determining acceptance of the phonetic unit by comparing a segment reliability of the test speech unit segments to a predetermined threshold value; wherein if the combined confidence measure is greater than the predetermined threshold value, the phonetic is accepted (To evaluate the effects of the whole process, the output after the manual correction is set as the reference. The errors are calculated as the difference between the determined boundaries and the reference boundaries. The segmentation rate is defined as the percentage of errors within 10ms and 20ms.).

Chou does not specifically teach:

a phonetic-confidence-measure verifying unit, for verifying phonetic confidence measures of the test speech unit segments to determine if the test speech unit segments correspond to the known text script; and

nor considering the phonetic confidence measures in the determining the acceptance of the phonetic unit.

In the same field of speech verification, Modi teaches:

a phonetic-confidence-measure verifying unit, for verifying phonetic confidence measures of the test speech unit segments to determine if the test speech unit segments correspond to the known text script (Regardless of the conventional procedure used to train the recognition HMMs 126 and the verification HMMs 134, in operation, the conventional verification subsystem 130 of the automated speech recognition system 100 uses the verification procedure shown in FIG. 5 to determine whether the recognized utterance is accepted or rejected; column 7 line 54. Figure 5 shows keywords and anti-keywords with probabilities that are used to come up with a likelihood ratio. One of ordinary skill in the art could appreciate that the HMMs used for recognition could be limited to the ones used for segmentation, and the same verification principles of Modi would apply.); and

considering the phonetic confidence measures in the determining the acceptance of the phonetic unit (the conventional verification subsystem 130 of the automated speech recognition system 100 uses the verification procedure shown in FIG. 5 to determine whether the recognized utterance is accepted or rejected; column 7 line 54.).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the confidence measure of Modi with the segmentation of and verification of Chou in order to allow for assurance that not only is the phonemes segmented in the right place, they are also the correct segments.

8. Consider claim 11, Chou teaches the system as claimed in claim 10, wherein the segmenting unit performs the following steps:

using a hidden Markov model (HMM) to cut the recorded speech corpus into N test speech unit segments referring to the phonetic information of the N phonetic units in the known text script, wherein each test speech unit segment is defined as correspondingly having an initial cutting point (For automatic processing, the boundary correction rules are applied instead of the human correction. These prior described rules are based on the knowledge from the observations in human correction procedures. The outputs of SD HMMs are accepted as the initial boundaries; page 894, column 2, line 20.);

performing a fine adjustment on the initial cutting point of the test speech unit segment according to at least one feature factor corresponding to each test speech unit segment and calculating at least one cutting point fine adjustment value corresponding to each test speech unit segment (For automatic processing, the boundary correction rules are applied instead of the human correction. These prior described rules are based on the knowledge from the observations in human correction procedures. The outputs of SD HMMs are accepted as the initial boundaries. The program then searches

in a local area for the acoustic features that match the phonetic properties of the units. The features include RMS power, voicing probability and FFT spectrogram derived from ESPS programs. The window sizes are varied from 5ms to 20ms according to the features and phonetic types of units. For example, a 5ms window of RMS power is applied to locate a plosive because there is a short burst of energy when the sound is released. If the specified acoustic features are not found in that area, the boundary is left no change; page 894, column 2, lines 20-35.); and

integrating the initial cutting point and the cutting point fine adjustment value of the test speech unit segment to obtain a cutting point of the test speech unit segment (the adjusted boundaries are further processed to update the parameters of the SD HMMs. These procedures are re, cursively performed until the average alternation of boundaries is under a threshold; page 894, column 2, line 34.).

9. Consider claim 12, Chou teaches the system as claimed in claim 11, wherein the feature factor of the test speech unit segment is a neighboring cutting point of the initial cutting point (The program then searches in a local area for the acoustic features that match the phonetic properties of the units; page 894, column 2 line 25.).

10. Consider claim 14, Chou teaches the method as claimed in claim 11, wherein the feature factor of the test speech unit segment is an energy value of the test speech unit segment (The features include RMS power, voicing probability and FFT spectrogram derived from ESPS programs; page 894, column 2, line 27.).

11. Consider claim 15, Chou teaches the method as claimed in claim 14, wherein the energy value is an energy value of a band pass signal and a high pass signal retrieved from a speaker-dependent band (The features include RMS power, voicing probability and FFT spectrogram derived from ESPS programs; page 894, column 2, line 27. The FFT spectrogram is made up of bandpass signals, and a group of FFT coefficients can be considered together to create a highpass signal. These signals would be in fact speaker dependent as speaker dependent HMMs are used.).

12. Consider claim 16, the method as claimed in claim 11, wherein each cutting point fine adjustment value has a weighted value, and the cutting point of the test speech unit segment is a weighted average of the initial cutting point and the cutting point fine adjustment value (These procedures are re, cursively performed until the average alternation of boundaries is under a threshold; page 894, column 2, line 34. This is in effect an average of the initial cutting point and the adjusted value.)

13. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou in view of Modi as applied to claim 2 above, and further in view of Toledano et al (Trying to Mimic Human Segmentation of Speech Using HHM and Fuzzy Logic Post-Correction Rules).

14. Consider claim 13, Chou in view of Modi teaches the system as claimed in claim 2, but does not specifically teach wherein the feature factor of the test speech unit segment is a zero crossing rate (ZCR) of the test speech unit segment.

In the same field of segmentation verification, Toledano teaches the feature factor of the test speech unit segment is a zero crossing rate (ZCR) of the test speech unit segment (Signal features at a time position are computed based on two windows of fixed width. Among these features is the zero crossing rate; page 4, column 1, paragraph 1.).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the use of zero crossing rate as taught by Toledano with the verification method of Chou and Modi in order to provide another tool for assessing the accuracy of the segmentation.

Allowable Subject Matter

15. Claims 1-9 are allowed.

16. The following is a statement of reasons for the indication of allowable subject matter:

The Prior Art of Record, specifically Chou et al. and Modi et al. does not specifically teach or fairly suggest the limitations "a segment-confidence-measure verifying step, for verifying segment confidence measures of all cutting points of the N test speech unit segments to determine if the N cutting points of the N test speech unit

segments are correct; a phonetic-confidence-measure verifying step, for verifying phonetic confidence measures of the test speech unit segments to determine if the test speech unit segments correspond to the known text script; and a determining step, for determining acceptance of the phonetic unit by comparing a combination of the segment confidence measures reliability and the phonetic confidence measures of the test speech unit segments to a predetermined threshold value; wherein if the combined confidence measure is greater than the predetermined threshold value, the phonetic unit is accepted for output." when combine the other limitations of the claim 1.

17. Claims 17 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

18. Consider claim 17, the combination of Chou and Modi does not teach or fairly suggest the system as claimed in claim 10, wherein in the segment-confidence-measure step, each segment confidence measure of the test speech unit segment is:

CMS = max(1- h(D)- epsilon g(c(s), f(s)), 0)

where h(D)= K(Epsilon wi |di –di|), D is a vector of multiple expert decisions of the cutting point, di is the cutting point, d = p(D) is a final decision of the cutting point, K(x) is a monotonically increasing function that maps a non-negative variable x into a value between 0 and 1, g(c(s), f(s)) is a cost function value between a cost function

ranging from 0 to 1, s is a segment, c(s) is a type category of the segment s and, f(s) are acoustic features of the segment.

19. Consider claim 18, the combination of Chou and Modi does not teach or fairly suggest the system as claimed in claim 10, wherein each phonetic confidence measure of the test speech unit segments is determined by:

CMV = min {LLRI, LLRF,O}, [LLR, = logP(X, {Ho)- logP(Xi I H,) where { |LLRF = logP(XF [Ho)-logP(XF] HI),

Xi is initial segment of the test speech unit segment, XF is final segment of the test speech unit segment, H0 is a null hypothesis of the test speech unit segment recorded correctly, HI is an alternative hypothesis of the test speech unit segment recorded incorrectly, and LLR is a log likelihood ratio.

Conclusion

20. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas C. Godbold whose telephone number is (571) 270-1451. The examiner can normally be reached on Monday-Thursday 7:00am-4:30pm Friday 7:00am-3:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached on (571) 272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DCG

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